UTILITY PATENT APPLICATION TRANSMITTAL

☐ DUPLICATE

Address to:	Attorney Docket No.	EM/YANG/5860
Assistant Commissioner for Patents Box PATENT APPLICATION Washington, DC 20231	First Named Inventor (or identifier)	Tai-Her YANG
	Total Pages	48

Transmitted herewith is a patent application under 37 CFR 1.53(b).

Entitled: THE ENCLOSED TYPE AIR COOLER DEVICE OF THE ROTATIONAL ELECTRICAL MACHINE

☒ 1. **Submitted herewith are the following:**

24 pages of specification, including claims and Abstract.
21 sheets of FORMAL drawings (Figs. 1-26).
18 claims.
1 Oath/Declaration signed by each inventor.
1 signed Inventor Small Entity Statement.
1 check in the amount of $475.00.

☒ 2. **The Commissioner is authorized to credit any overpayment and charge any deficiency in any fees required under 37 CFR 1.16 and/or 1.17, to Deposit Account No. 02-0200.**

☐ 3. Insert before the first sentence of the specification: - - This application claims the benefit of provisional application number _____ filed _____. - -

☐ 4. Insert before the first sentence of the specification: - - This application is a Continuation-in-part of nonprovisional application number _____ filed _____. - -

☐ 5. Other:_____.

THE FILING FEE IS CALCULATED AS FOLLOWS:				Basic Fee:	$690.00
Total Claims:	18	- 20 =	0	X $18 =	0.00
Independent Claims:	1	- 3 =	0	X $78 =	0.00
Correspondence Address: BACON & THOMAS, PLLC, 625 Slaters Lane, 4th Floor, Alexandria, VA 22314-1176				Multiple Dependent Claim (add $260 00).	260 00
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July 28, 2000	Eugene Mar		25,893

(29Dec1999)

Independent Inventor

VERIFIED STATEMENT (DECLARATION) BY AN INDEPENDENT INVENTOR CLAIMING SMALL ENTITY STATUS UNDER *37 CFR 1.9(F) AND 1.27(b)*

Applicant or Patentee: Tai-Her YANG	Docket #:
Serial or Patent Number:	Group Art Unit:
Filed or Issued:	Examiner:

Title: The Enclosed Type Air Cooler Device of the Rotational Electrical Machine

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in *37 CFR 1.9(c)* for purposes of paying reduced fees to the Patent and Trademark Office with regard to the matter described in:

- ☒ The specification filed herewith, with the title as listed above.
- ☐ The patent application identified above.
- ☐ The PCT international patent application identified above.
- ☐ The patent number identified above.

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license any rights in the invention to any person who could not be classified as an independent inventor under *37 CFR 1.9(c)* if that person had made the invention, or to any concern which would not qualify as a small business concern under *37 CFR 1.9(d)* or a nonprofit organization under *37 CFR 1.9(e)*.

Each person, concern or organization to which I have assigned, granted, conveyed or licensed or am under an obligation under contract or law to assign, grant, convey or license any rights in the invention is listed below:

- ☒ no such person, concern or organization.
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I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate *(37 CFR 1.28(b))*.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine, or imprisonment, or both, under *section 1001 of Title 18 of the United States Code*, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which the verified statement is directed.

INVENTOR'S NAME	DATE	SIGNATURE
Tai-Her YANG	July 24, 2000	Tai-Her Yang

TITLE: THE ENCLOSED TYPE AIR COOLER DEVICE OF THE ROTATIONAL ELECTRICAL MACHINE

BACKGROUND OF THE INVENTION

(a) Field of the Invention

An enclosed type air cooler device of the rotational electrical machine which discloses an innovative design of an enclosed type cooling air flow circuit structure in that the high temperature air flow inside the enclosed type rotational electrical machine is pumped out to the outside installed cooler device in enclosed type flow circuit and is then pumped back to the enclosed type rotational electrical machine inside.

(b) Description of the Prior Art:

The conventional cooling methods for enclosed type electrical machines usually adopt the free air cooling (as shown in fig. 1 and fig. 2), i.e. one or more than one dissipating fins 101a are installed at the outside casing of the enclosed type rotational electrical machine 10a to dissipate the accumulated heat of the rotational electrical machine through the free air convection for cooling; or adopt the external air forced cooling method(as shown Fig. 3), i.e. the enclosed type rotational electrical machine 10b is further installed with a fan 101b to blow the air for cooling; or adopt the liquid cooling method (as shown in Fig. 4), i.e. the rotational electrical machine 10c is cooled by the external coolant 101c. The disadvantage of the aforesaid cooling technology is that the enclosed type rotational electrical machine's internal heat flow cannot be pumped out directly but have

to relay on the enclosed type electrical machine's casing to dissipate the internally accumulated heat resulting a higher temperature difference between the inside and outside, therefore its heat dissipation is not very effective which affects the rotational electrical machine's performance very much.

SUMMARY OF THE INVENTION

The invention discloses an innovative design of an enclosed type air cooler device of the rotational electrical machine, wherein it is characterized in the original creation of that the high temperature air flow inside the enclosed type rotational electrical machine is pumped out to the outside installed cooler device in enclosed type flow circuit and is then pumped back to the enclosed type rotational electrical machine inside without jeopardizing its closed tight functions.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a diagram of the conventional free air cooling structure of the enclosed type electrical machines.

Fig. 2 is the side view of the conventional free cooling structure of the enclosed type electrical machines.

Fig. 3 is a diagram of a conventional forced air cooling structure of the enclosed type electrical machines.

Fig. 4 is a schematic diagram of a conventional liquid cooling structure of the enclosed type rotational electrical machines.

Fig. 5 is the longitudinal sectional view of the invention illustrating that the enclosed type rotational electrical

machine and its cooler device are in an integrated structure.

Fig. 6 is the cross-sectional view of the invention illustrating an integrated structure of the enclosed type rotational electrical machine and its cooler device.

Fig. 7 is the longitudinal sectional view of the invention illustrating an integrated structure of the enclosed type rotational electrical machine and its cooler device with additional internally installed heat absorbing fins.

Fig. 8 is the cross-sectional diagram of the invention illustrating an integrated structure of the enclosed type rotational electrical machine and its cooler device.

Fig. 9 is a structural schematic diagram illustrating that the enclosed type rotational electrical machine and its cooler device are separated.

Fig. 10 is an embodying example schematic diagram of the centrifugal type radial fan of the invention.

Fig. 11 is a structural sectional view of the invention illustrating that the tubular shape enclosed type rotational electrical machine and its cooler device are respectively independent and combined together.

Fig. 12 is a structural side view of the invention illustrating that the tubular shape enclosed type rotational electrical machine and its cooler device are respectively independent and combined together.

Fig. 13 is an embodying example schematic diagram of the centrifugal type radial fan of the invention.

Fig. 14 is a structural sectional view of the invention illustrating that the air chamber type enclosed type rotational electrical machine and its cooler device are respectively independent and combined together.

Fig. 15 is a structural side view of the invention illustrating that the air chamber type enclosed type rotational electrical machine and its cooler device are respectively independent and combined together.

Fig. 16 is an embodying example schematic diagram of the centrifugal type radial fan of the invention.

Fig. 17 is a structural sectional view of the invention illustrating that the air chamber type enclosed type rotational electrical machine and its cooler device are respectively independent and separately installed.

Fig. 18 is an embodying example schematic diagram of the centrifugal type radial fan of the invention.

Fig. 19 is a structural schematic diagram of the invention illustrating that the enclosed type rotational electrical machine is combined with other mechanisms.

Fig. 20 is an embodying example schematic diagram of the centrifugal type radial fan of the invention.

Fig. 21 is a structural sectional schematic diagram of the invention illustrating an integrated structure of the enclosed type rotational electrical machine and other mechanisms.

Fig. 22 is an embodying example schematic diagram of the centrifugal type radial fan of the invention.

Fig. 23 is a schematic diagram of the invention illustrating that the cooler device is used as for heating source.

Fig. 24 is a schematic diagram of the invention illustrating a free heating cooler device structure.

Fig. 25 is a schematic diagram of the invention illustrating a controlled heating cooler structure.

Fig. 26 is a schematic diagram of the invention

illustrating that the cooler device is installed with air pass tubes.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

It shall be noted first that the enclosed type air cooler device of the enclosed type rotational electrical machine of the invention discloses an innovative design of an enclosed type air cooler device of a rotational electrical machine, wherein it is mainly constituted by a rotational electrical machine 1 and a cooler device 2, and it is mainly characterized in the following:

- A rotational electrical machine which is mainly referred to the rotational machines such as motors or generators, etc., whereof it is characterized that a air inlet and an air outlet are provided at its casing and through a fan simultaneously driven by the power output shaft of the rotational electrical machine, or an independently installed fan device or both of them installed simultaneously to pump the air or other selected gases inside the rotational electrical machine to allow the cooling air stream flow through the outlet to the enclosed type air cooler for indirect heat dissipation, then is pumped back to the rotational electrical machine;
- A cooler device, whereof it and the rotational electrical machine casing appear individually independent structures and are further combined, or it and the rotational electrical machine appear in an integrated structure, or it and the casing of other peripheral mechanisms with cooling effects (such as the driving device casing or load casing) appear in an integrated structure; therein outside

of the cooler device can be installed with heat dissipating fins for free air cooling or fanned air cooling or coolant cooling, whereof the cooler devices are constituted by tubular shape structures or other geometric shape structures, whereof its interior appears in tubular shape or air chamber type structures and the heat absorbing fins can be installed to absorb and transfer the heat energy for dissipation to the outside; wherein the internal air flow circuit or air chamber can be an empty space or can be installed with a air filter device or can be simultaneously installed with an clean cover or a clean plug for opening and closing to do cleaning and maintenance as well as removing the condensed moisture or internal eroded fragment powders such as the DC machine brush fragment powder.

Fig. 5 and 6 show one of the embodying examples of the invention, whereof it is comprised of that an air outlet 112a and an air inlet 111a are provided at the front and rear end of the casing 11a of the said rotational electrical machine 1a, and an integrally installed air cooler device 2a is further installed at the outside of the casing 11a, and the rotational electrical machine 1a is enclosed by the casing 21a of the said cooler 2a, whereby the casing 21a of the cooler device 2a and the casing 11a of the rotational electrical machine 1a form a tubular space 22a which is connected with the inlet 111a and the outlet 112a; further, a centrifugal type radial or axial fan 13a is installed on the power output shaft 12a located at the outlet 112a side of the rotational electrical machine 1; wherein the casing 21a of the cooler device 2a can be installed with several heat dissipating fins 212a which allow the cooler device 2a to match with a free air cooler device 3, or to match

with a conventional forced air cooler device 4; in addition, a cooling circuit can be further provided inside the cooler device to match with a liquid cooler device 5 or to match with a heat exchanger device 6; furthermore, the axial heat dissipating fins 113a, 211a are installed at the outside of the casing 11a and at the inside of the casing 21a to improve the heat conduction in the tubular space 22a, whereof the air or other gases inside the tubular space 22a between the rotational electrical machine 1a the cooler device 2a forms the cooling flow which constitutes the enclosed type air cooler device of the rotational electrical machine of the invention.

When the rotational electrical machine 1a produces power, the centrifugal type radial or axial fan 13a is simultaneously driven to rotate by the said power output shaft 12a to pump the cooling gas contained heat from the outlet 112a to the tubular space 22a constituted by the cooler device 2a and through the internally installed heat dissipating fins 111a, 211a to transfer heat energy as well as further through the cooler device 2a to match with a free air cooler device 3 or to match with a conventional forced air cooler device 4, besides, the internal cooling circuits can be further installed inside the cooler device to match with the other final cooler devices such as a liquid cooler device 5 or a heat exchanger 6, etc. thereby to produce heat dissipating function and the cooled down gas flow can be pumped back through the inlet 111a to the inside of the rotational electrical machine 1a, thus the accumulated heat inside the enclosed type rotational electrical machine casing can be effectively removed to improve the cooling effect.

Besides, as shown in Fig. 7 and 8 of the invention, the

tubular space 22a between the said rotational electrical machine 1a and the cooler device 2a is installed with heat absorbing fins 221a which causes the tubular space 22a to form a blended circuit shape, and through this to allow the said heat absorbing fins 221a to absorb the hot gas heat and transfer it to the outside thereby to improve the heat dissipating effect of the rotational electrical machine.

In addition, as shown in Fig. 9 of the invention, the rotational electrical machine 1b and the cooler device 2b can be further made in the separated structures, whereof the inlet 111b and outlet 112b are provided at the casing 11b of the said rotational electrical machine 1b, whereof a centrifugal type radial or axial fan 13b is installed on the power output shaft 12b at the outlet 112b side (as shown in Fig. 10); whereof the said cooler device 2b forms a tubular circuit structure 22b which is not limited to a particular shape, besides of blended shape, it can be also formed to helical shape or other irregular shapes; whereof the said cooler device 2b can be matched with a free air cooler device 3 or the cooler device 2a can be matched with a forced air cooler device 4, and cooling circuits can be further installed inside the cooler device to match with a liquid cooler device 5 or to match with a heat exchanger 6, or the cooler device 2b can combine with several different cooling technologies to constitute in an integrated structure; through this, both ends of the tubular circuit structure 22b of the cooler device 2b are respectively connected to the inlet 111b and outlet 112b of the said rotational electrical machine 1b, wherein the rotational electrical machine 1b and the tubular circuit structure 22b of the cooler device 2b are filled in with air or other gases thereby to constitute the

enclosed type air cooler device of the rotational electrical machine of the invention.

The effect of the aforesaid embodying example is that when the rotational electrical machine 1b produces power, the centrifugal type radial or axial fan 13b is simultaneously driven by the power output shaft 12b to rotate whereby to pump the hot gas inside the rotational electrical machine 1b through the outlet 112b to the outside tubular circuit structure 22b constituted by the cooler device 2b, whereof the cooler device 2b is matched with a free air cooler device 3 or matched with a conventional forced air cooler device 4, or the cooling circuit can be installed inside the cooler device to match with a liquid cooler device 5 or to match with a heat exchanger device 6; wherein the cooled down coolant gas flow is pumped through the inlet 111b of the rotational electrical machine 1b to enter the rotational electrical machine 1b interior to provide cooling for the rotational electrical machine, thereby the accumulated heat inside the enclosed type electrical machine casing can be effectively removed thus to improve the cooling effect of the rotational electrical machine 1b.

As shown in Fig. 11 and 12, the said cooler 2c is an independent structure and appear in a bended piping casing 21c, whereof one or more than one heat dissipating fins 212c are installed at the outside of the casing 21c; whereof the inlet 111c and outlet 112c are respectively provided at selected locations on the casing 11c of the said rotational electrical machine 1c, further, its internal power output shaft 12c is also installed with a centrifugal type radial or axial fan 13c (as shown in Fig. 13), wherein the inlet of the cooler device 2c is connected to the outlet 112c of the rotational electrical

machine 1c, and the said cooler device 2c is further connected to the inlet 111c of the rotational electrical machine 1c to allow the said cooler device 2c to be attached or ring installed at the outside of the casing 11c whereby to cause the cooler device 2c and the casing of the rotational electrical machine 1c appear a special and inter-combined structure; thereby the hot gas is pumped to the cooler device 2c through the centrifugal type radial or axial fan 13c to achieve the aforesaid circulating heat dissipation effect.

The further embodying example structure of the invention is as shown in Fig. 14 and 15, whereof the cooler device 2d is comprised of a casing 21d with an internally installed air chamber 22d, whereof the outside of the casing 21d is installed with several heat dissipating fins 212d and the inside of the air chamber 22d is installed with heat absorbing fins 221d whereby to cause the said air chamber 22d constitute a bended circuit shape, and the both ends of the casing 21d are respectively provided with inlet 213d and outlet 214d; besides, the inlet 111d and the outlet 112d are respectively provided at proper locations on the casing 11d of the said rotational electrical machine 1d, whereof its internal power output shaft 12d is installed with a centrifugal type radial or axial fan 13d (as shown in Fig. 16), therein the inlet pipe 213d of the said cooler device 2d is connected to the outlet 112d of the rotational electrical machine 1d, while the outlet pipe 214d of the said cooler device 2d is further connected to the inlet 111d of the rotational electrical machine 1d thereby to allow the said cooler device 2d be attached to the outside of the casing 11d, wherein the cooler device 2d and the casing of the rotational electrical machine 1d are individually independent

structures and they are further combined; thereby the hot gas is pumped to the cooler device 2d through the centrifugal type radial or axial fan 13d installed inside the said rotational electrical machine 1d to achieve the aforesaid circulating heat dissipating effect.

The cooler device 2d' and the rotational electrical machine 1d' of the invention can also be separated (as shown in Fig. 17 or Fig. 18) and interconnected through the inlet pipe 213d' and the outlet pipe 214d' whereby to constitute an enclosed type air cooling circuit structure of the invention, wherein the said cooler device 2d' can be installed at other proper locations as required (as shown in Fig. 19 or Fig. 20), i.e. the cooler device 2d' can be installed on the casing 7 of other machine and is further matched with a free air cooler device 3, or the cooler device 2a can be matched with a conventional forced air cooler device 4, in addition, the cooling circuits can be installed inside the cooler device to match with a liquid cooler device 5 or to match with a heat exchanger 6 whereby the hot gas inside the cooler device 2d' can be cooled and pumped to the rotational electrical machine 1d' interior to effectively remove the accumulated heat inside the enclosed type rotational electrical machine casing thereby to improve the cooling effect.

In considering the economy of the structures, the cooler device of the invention can be directly designed to have an integrated structure with other devices (as shown in Fig. 21 or Fig. 22), whereof the cooler device 2e is in an integrated structure with the casing 81 of the transmission mechanism 8 and the outside of the casing 81 is made into a air chamber 22e, wherein several heat absorbing fins 221e are installed

at the inside of the said air chamber 22e, and through the arrangement of the heat absorbing fins 221e to make the air chamber 22e constitute a bended circuit shape to improve its heat absorbing effect; thereof through the combination of the said rotational electrical machine 1e and the casing 81 of the transmission mechanism 8, its outlet 112e can be connected to the inlet of the cooler device 2e, and the circuit end of the air chamber 22e is connected with an outlet pipe 214e which is further connected to the inlet 111e of the rotational electrical machine 1e thereby to constitute the enclosed type cooling flow circuit structure of the invention whereby to achieve the aim of improving the heat dissipating effect of the rotational electrical machine.

In addition, the pumping methods for the cooling air or other gases in the invention include the following:

- A centrifugal type radial or axial fan 13 is installed on the rotating shaft of the rotational electrical machine 1 to transfer the air or other gases, or:
- A gas pump 9 is further installed at the locations such as the inlet 111 or outlet 112 or pipe 22 or the cooler device 2 to pump the air or other gases inside the rotational electrical device 1, or :
- A centrifugal type radial or axial fan 13 is simultaneously installed at the rotating shaft of the rotational electrical machine 1, and a gas pump 9 is further installed at the locations such as such as the inlet 111 or outlet 112 or pipe 22 or the cooler device 2 to pump the air or other gases inside the rotational electrical device 1.

The internal air chamber of the cooler device 2 in the aforesaid embodying examples can be an empty space or installed

with internal heat conducting fins or can be further installed with air filter devices 222a, 222b, 222c, 222d, 222e or simultaneously installed with an clean cover or clean plug for opening/closing to remove the condensed moisture or the internally eroded fragment powders generated inside the rotational electrical machines 1a, 1b, 1c, 1d, 1e, such as the brush fragment powders of the DC machines thereby to avoid affecting the operating functions.

Besides, as shown in Fig. 23 and Fig. 24, the said cooler device 2f of the invention can also be used to provide a heating source function, wherein the pipe 22f can be coupled with the heating target 100, and the hot gas produced by the rotational electrical machine 1 is passed through the pipe 22f to heat up the heating target coupled with the pipe 22f such as the car batteries. Thereof, a distributing pipe 22f' and a control valve 200 (as shown in Fig. 25) can be further installed between the inlet and outlet of the pipe 22f toward the heating target 100 to provide a bypassed or distributed hot gas flow for the cooler device 2f , and to further control the heating temperature of the heating target through switching the said control valve 200; therein the said control valve 200 can be operated manually or controlled through detection of the conventional temperature sensor device T100 which is selectively installed according to the requirements on the heating target to do bypass or distributing flow when reaching the set temperature in order to reduce or stop the heating process on the target objects; or the outside of the said pipe 22f as shown in Fig. 26 can be further installed with a air guiding pipe 223f to provide heat exchanged output from the hot gas flow produced by the rotational electrical machine so

as to provide heating gas for other places' use, such as to produce warming effect in an enclosed or semi-enclosed space or warming up the car battery, etc.

As summarized from the above descriptions, the invention has disclosed an innovative design of an enclosed type air cooler device of the rotational electrical machine, wherein it is characterized in that the hot gas inside the enclosed type rotational electrical machine is pumped out to the outside air cooler device in an enclosed type air flow circuit and is then pumped back to the inside of the enclosed type rotational electrical machine without jeopardizing its enclosed function, therein it effectively improves the cooling effect of the enclosed type rotational electrical machine.

CLAIMS

1. An enclosed type air cooler device which is constituted by a rotational electrical machine and a cooler device, wherein its main structure characteristics include the following:

- A rotational electrical machine which is mainly referred to the rotational machines such as motors or generators, etc., whereof it is characterized that a air inlet and an air outlet are provided at its casing and through a fan simultaneously driven by the power output shaft of the rotational electrical machine, or an independently installed fan device or both of them installed simultaneously to pump the air or other selected gases inside the rotational electrical machine to allow the cooling air stream flow through the outlet to the enclosed type air cooler for indirect heat dissipation, then is pumped back to the rotational electrical machine;
- A cooler device, whereof it and the rotational electrical machine casing appear individually independent structures and are further combined, or it and the rotational electrical machine appear in an integrated structure, or it and the casing of other peripheral mechanisms with cooling effects (such as the driving device casing or load casing) appear in an integrated structure; therein outside of the cooler device can be installed with heat dissipating fins for free air cooling or fanned air cooling or coolant cooling, whereof the cooler devices are constituted by tubular shape structures or other geometric shape structures, whereof its interior appears in tubular shape or air chamber type structures

and the heat absorbing fins can be installed to absorb and transfer the heat energy for dissipation to the outside; wherein the internal air flow circuit or air chamber can be an empty space or can be installed with a air filter device or can be simultaneously installed with an clean cover or a clean plug for opening and closing to do cleaning and maintenance as well as removing the condensed moisture or internal eroded fragment powders such as the DC machine brush fragment powder.

2. The enclosed type air cooler device of the rotational electrical machine as in claim 1, whereof it is comprised of that an air outlet and an air inlet are provided at the front and rear end of the casing of the said rotational electrical machine, an integrally installed air cooler is further installed at the outside of the casing, and the rotational electrical machine is enclosed by the casing of the said cooler, whereby the casing of the cooler device and the casing of the rotational electrical machine form the tubular shape which is connected with the inlet and the outlet, besides, the power output shaft located at the outlet side of the rotational electrical machine is installed with a centrifugal type radial or axial fan; the casing of the cooler device can be installed with several heat dissipating fins which allow the cooler device to match with other cooler devices.

3. The enclosed type air cooler device of the rotational electrical machine as in claim 2, wherein the piping between the rotational electrical machine and the cooler device is installed with heat absorbing fins which cause the piping forms a bended circuit shape, whereby the heat energy is

absorbed by the said heat absorbing fins and transferred to the outside to further improve the overall heat dissipation effect of the rotational electrical machine.

4. The said enclosed type air cooler device of the rotational electrical machine as in claim 1, wherein the rotational electrical machine and the cooler device can be further made in the separated structures, whereof the inlet and outlet are provided at the casing of the said rotational electrical machine, whereof a centrifugal type radial or axial fan is installed on the power output shaft at the outlet side; whereof the said cooler device forms a tubular circuit structure, whereof besides of blended shape, it can be also formed to helical shape or other irregular shapes; whereof the said cooler device can be matched with other cooler devices.

5. The said enclosed type air cooler device of the rotational electrical machine as in claim 1, wherein the said cooler is an independent structure and appear in a bended piping casing, whereof one or more than one heat dissipating fins are installed at the outside of the casing; whereof the inlet and outlet are respectively provided at selected locations on the casing of the said rotational electrical machine, further, its internal power output shaft is also installed with a centrifugal type radial or axial fan, wherein the inlet of the cooler device is connected to the outlet of the rotational electrical machine, and the said cooler device is further connected to the inlet of the rotational electrical machine to allow the said cooler device to be attached or ring installed at the outside of the casing whereby to cause the cooler device and the casing of the

rotational electrical machine appear a special and inter-combined structure; thereby the hot gas is pumped to the cooler device through the centrifugal type radial or axial fan to achieve the aforesaid circulating heat dissipation effect.

6. The said enclosed type air cooler device of the rotational electrical machine as in claim 1, wherein the cooler device is comprised of a casing with an internally installed air chamber, whereof the outside of the casing is installed with several heat dissipating fins and the inside of the air chamber is installed with heat absorbing fins whereby to cause the said air chamber constitute a bended circuit shape, and the both ends of the casing are respectively provided with inlet and outlet; besides, the inlet and the outlet are respectively provided at proper locations on the casing of the said rotational electrical machine, whereof its internal power output shaft is installed with a centrifugal type radial or axial fan, therein the inlet pipe of the said cooler device is connected to the outlet of the rotational electrical machine, while the outlet pipe of the said cooler device is further connected to the inlet of the rotational electrical machine thereby to allow the said cooler device be attached to the outside of the casing, wherein the cooler device and the casing of the rotational electrical machine are individually independent structures and they are further combined; thereby the hot gas is pumped to the cooler device through the centrifugal type radial or axial fan installed inside the said rotational electrical machine 1d to achieve the aforesaid circulating heat dissipating effect.

7. The said enclosed type air cooler device of the rotational electrical machine as in claim 6, wherein the cooler device and the rotational electrical machine of the invention can also be separated and interconnected through the inlet pipe and the outlet pipe whereby to constitute an enclosed type air cooling circuit structure of the invention, wherein the said cooler device can be installed at other proper locations as required, the cooler device can also be installed on the casing of other machines and is further matched with other cooler devices.

8. The said enclosed type air cooler device of the rotational electrical machine as in claim 1, wherein the cooler device of the invention can be directly designed to have an integrated structure with other devices, whereof the cooler device is in an integrated structure with the casing of the transmission mechanism and the outside of the casing is made into a air chamber, wherein several heat absorbing fins are installed at the inside of the said air chamber, and through the arrangement of the heat absorbing fins to make the air chamber constitute a bended circuit shape to improve its heat absorbing effect; thereof through the combination of the said rotational electrical machine and the casing of the transmission mechanism, its outlet can be connected to the inlet of the cooler device, and the circuit end of the air chamber is connected with an outlet pipe which is further connected to the inlet of the rotational electrical machine thereby to constitute the enclosed type cooling flow circuit structure of the invention whereby to achieve the aim of improving the heat dissipating effect of the rotational electrical machine.

9. The said enclosed type air cooler device of the rotational electrical machine as in claim 1, wherein the transport methods for the cooling air or other gases include: The rotating shaft of the rotational electrical machine is installed with a centrifugal type radial of axial fan to transfer the air or other gases.

10. The said enclosed type air cooler device of the rotational electrical machine as in claim 1, wherein the transport methods for the cooling air or other gases include: A gas pump is additionally installed at the inlet or outlet of the rotational electrical machine, or piping or the cooler devices etc. to pump the air or other gases inside the rotational electrical machine.

11. The said enclosed type air cooler device of the rotational electrical machine as in claim 1, wherein the transport methods for the cooling air or other gases include: A centrifugal type radial or axial fan is simultaneously installed at the rotating shaft of the rotational electrical machine, and a gas pump is further installed at the locations such as such as the inlet or outlet or pipe or the cooler device to pump the air or other gases inside the rotational electrical device.

12. The said enclosed type air cooler device of the rotational electrical machine as in claim 1, wherein the internal air chamber of the cooler device can be an empty space or installed with internal heat conducting fins or can be further installed with air filter devices or simultaneously installed with an clean cover or clean plug for opening/closing to remove the condensed moisture or the internally eroded fragment powders generated inside

the rotational electrical machines such as the brush fragment powders of the DC machines thereby to avoid affecting the operating functions.

13. The said enclosed type air cooler device of the rotational electrical machine as in claim 1, wherein the cooler device is matched with a free air cooler device or matched with a conventional forced air cooler device; in addition, a cooling circuit can be further provided inside the cooler device to match with a liquid cooler device or to match with a heat exchanger device.

14. The said enclosed type air cooler device of the rotational electrical machine as in claim 1, wherein the said cooler device can also be used to provide a heating source function, wherein the pipe can be coupled with the heating target, and the hot gas produced by the rotational electrical machine is passed through the pipe to heat up the heating target coupled with the pipe such as the car batteries.

15. The said enclosed type air cooler device of the rotational electrical machine as in claim 1, wherein a distributing pipe and a control valve can be further installed between the inlet and outlet of the pipe toward the heating target to provide a bypassed or distributed hot gas flow for the cooler device, and to further control the heating temperature of the heating target through switching the said control valve.

16. The said enclosed type air cooler device of the rotational electrical machine as in claim 15, wherein the said control valve can be operated manually or controlled through detection of the conventional temperature sensor device

which is selectively installed according to the requirements on the heating target to do bypass or distributing flow when reaching the set temperature in order to reduce or stop the heating process on the target objects.

17. The said enclosed type air cooler device of the rotational electrical machine as in claim 14 or claim 15, wherein the outside of the said pipe can be further installed with a air guiding pipe to provide heat exchanged output from the hot gas flow produced by the rotational electrical machine so as to provide heating gas for other places' use.

ABSTRACT

An enclosed type air cooler device of the enclosed type rotational electrical machine discloses an innovative design of an enclosed type air cooler device of a rotational electrical machine, wherein it is comprised of that a air inlet and an air outlet are provided at its casing and through a fan simultaneously driven by the power output shaft of the rotational electrical machine, or an independently installed fan device or both of them installed simultaneously to pump the air or other selected gases inside the rotational electrical machine to allow the cooling air stream flow through the outlet to the enclosed type air cooler for indirect heat dissipation, then is pumped back to the rotational electrical machine; thereof the cooler device and the rotational electrical machine casing appear individually independent structures and are further combined, or it and the rotational electrical machine appear in an integrated structure, or it and the casing of other peripheral mechanisms with cooling effects (such as the driving device casing or load casing) appear in an integrated structure; therein outside of the cooler device can be installed with heat dissipating fins for free air cooling or fanned air cooling or coolant cooling, whereof the cooler devices are constituted by tubular shape structures or other geometric shape structures, whereof its interior appears in tubular shape or air chamber type structures and the heat absorbing fins can be installed to absorb and transfer the heat energy for dissipation to the outside; wherein the internal air flow circuit or air chamber can be an empty space or can be installed with a air filter

device or can be simultaneously installed with an clean cover or a clean plug for opening and closing to do cleaning and maintenance as well as removing the condensed moisture or internal eroded fragment powders such as the DC machine brush fragment powder.

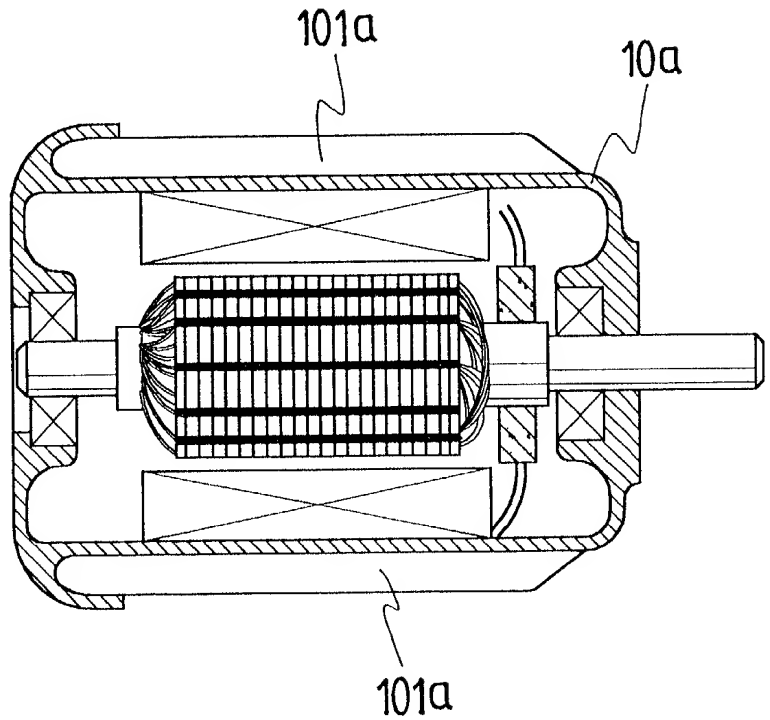


FIG. 1

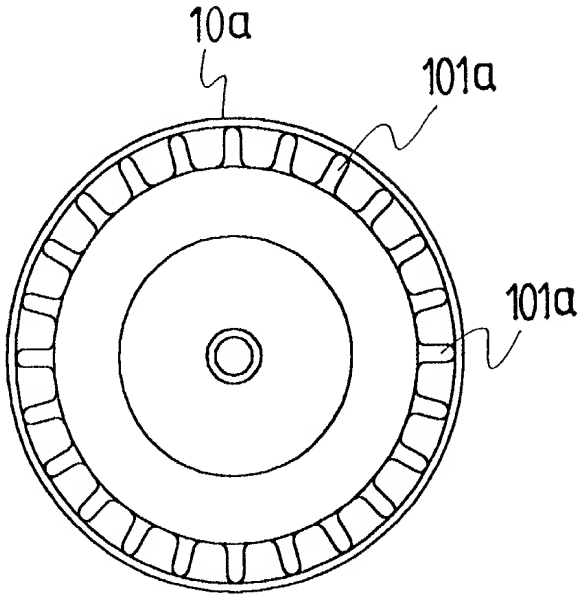


FIG. 2

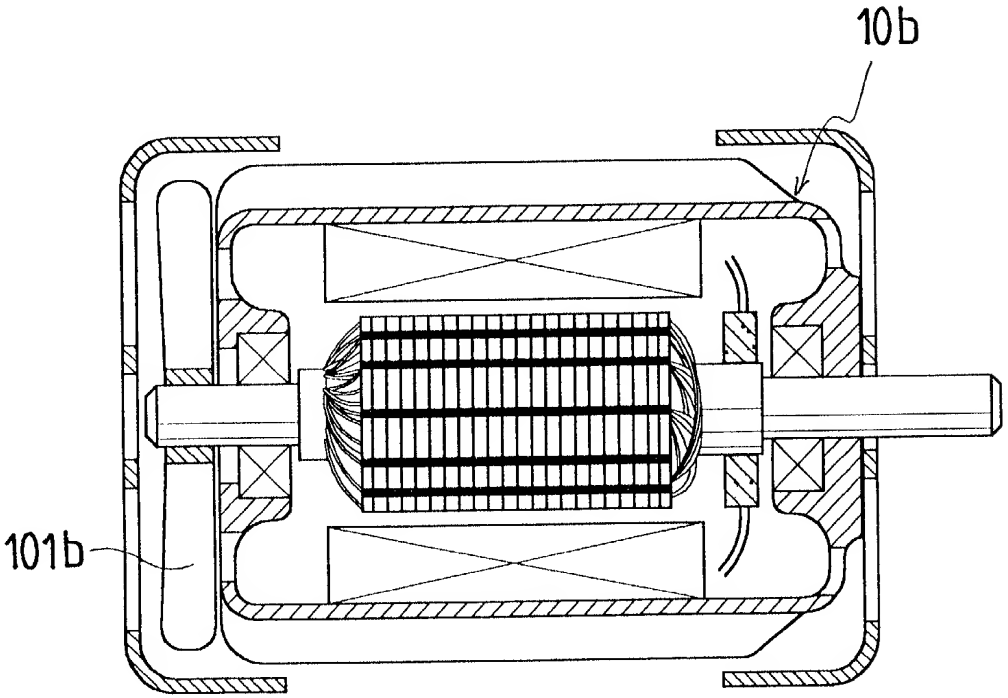


FIG. 3

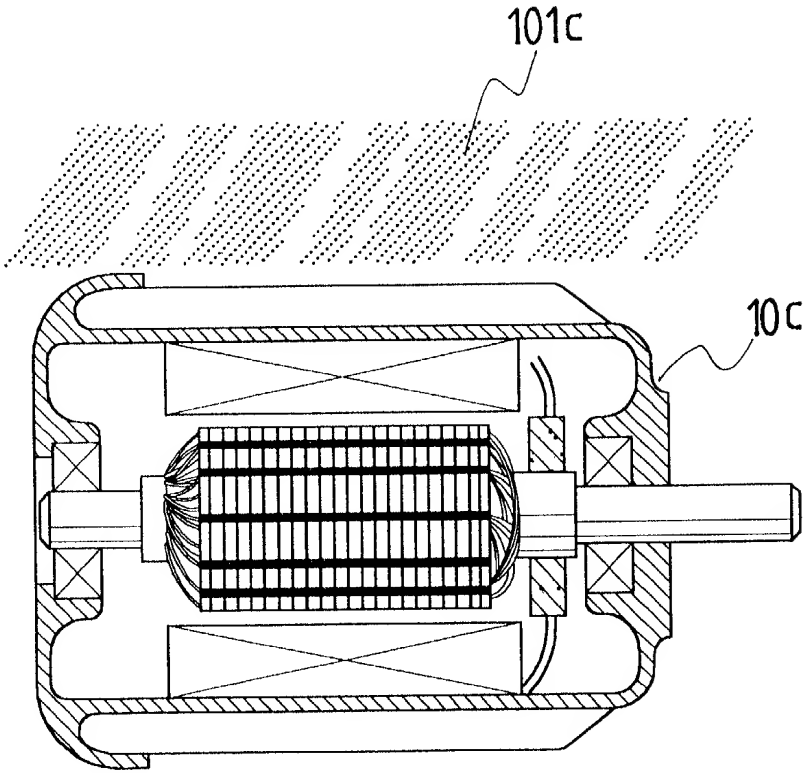


FIG. 4

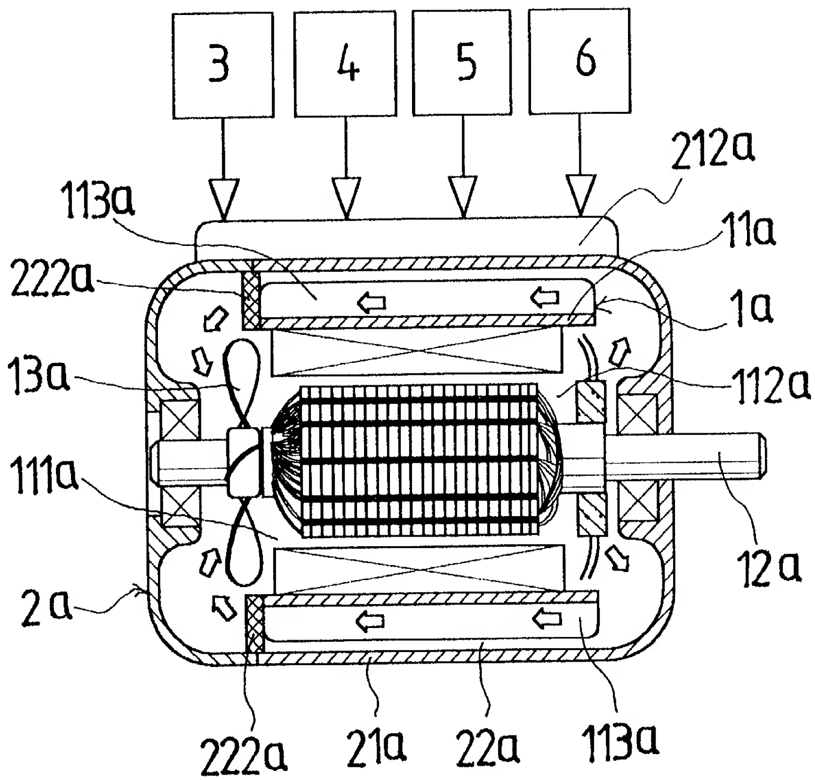


FIG. 5

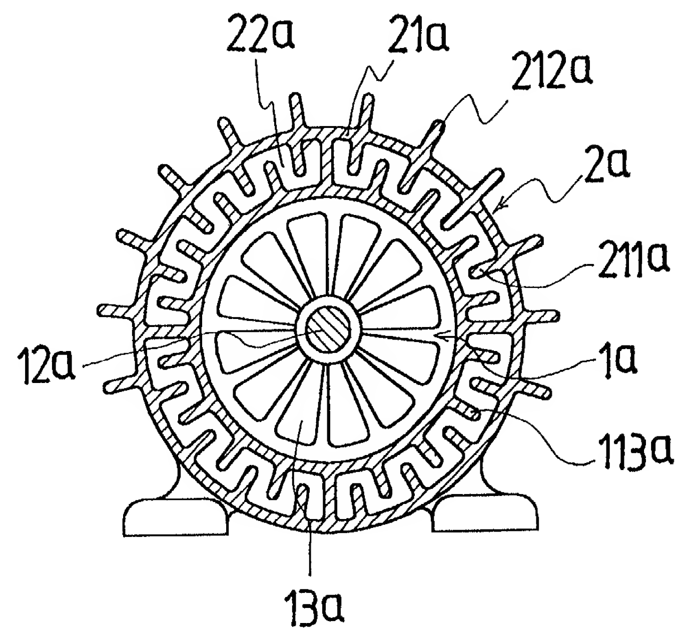


FIG. 6

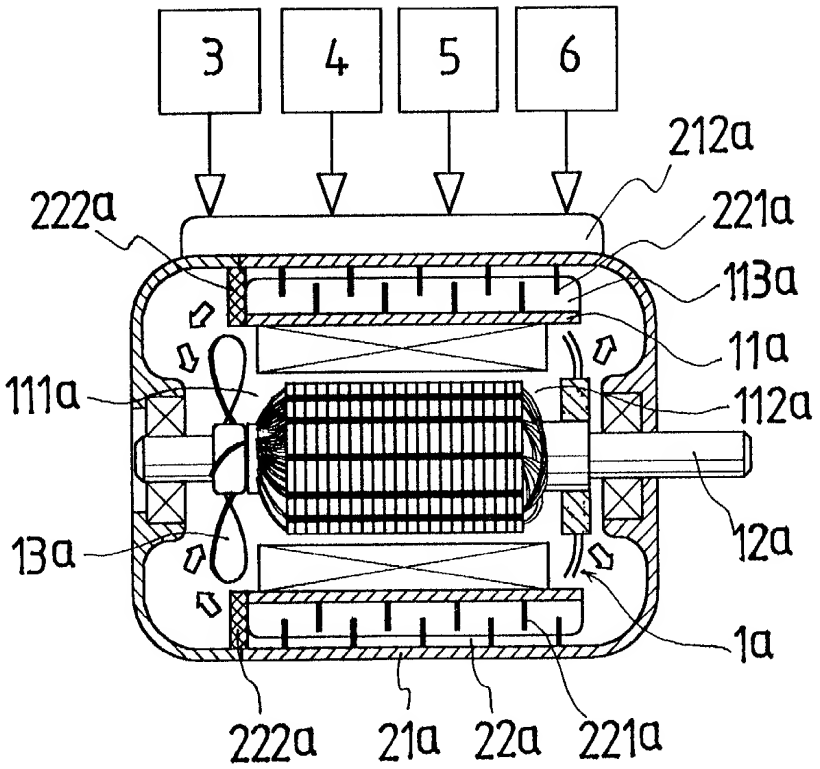


FIG. 7

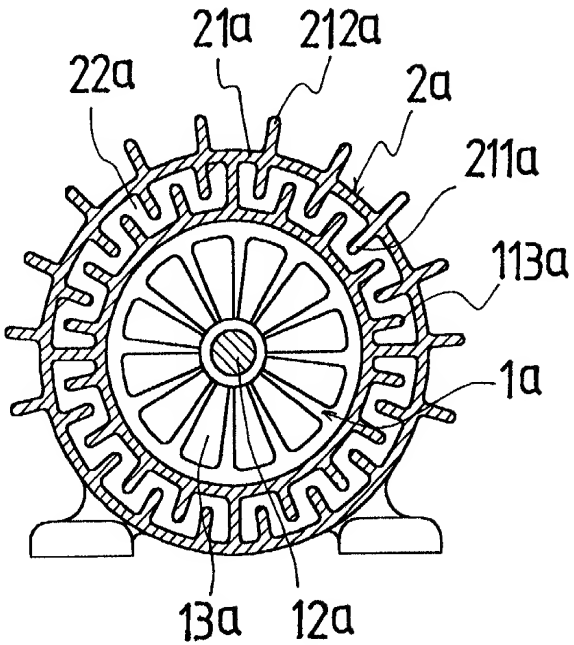


FIG. 8

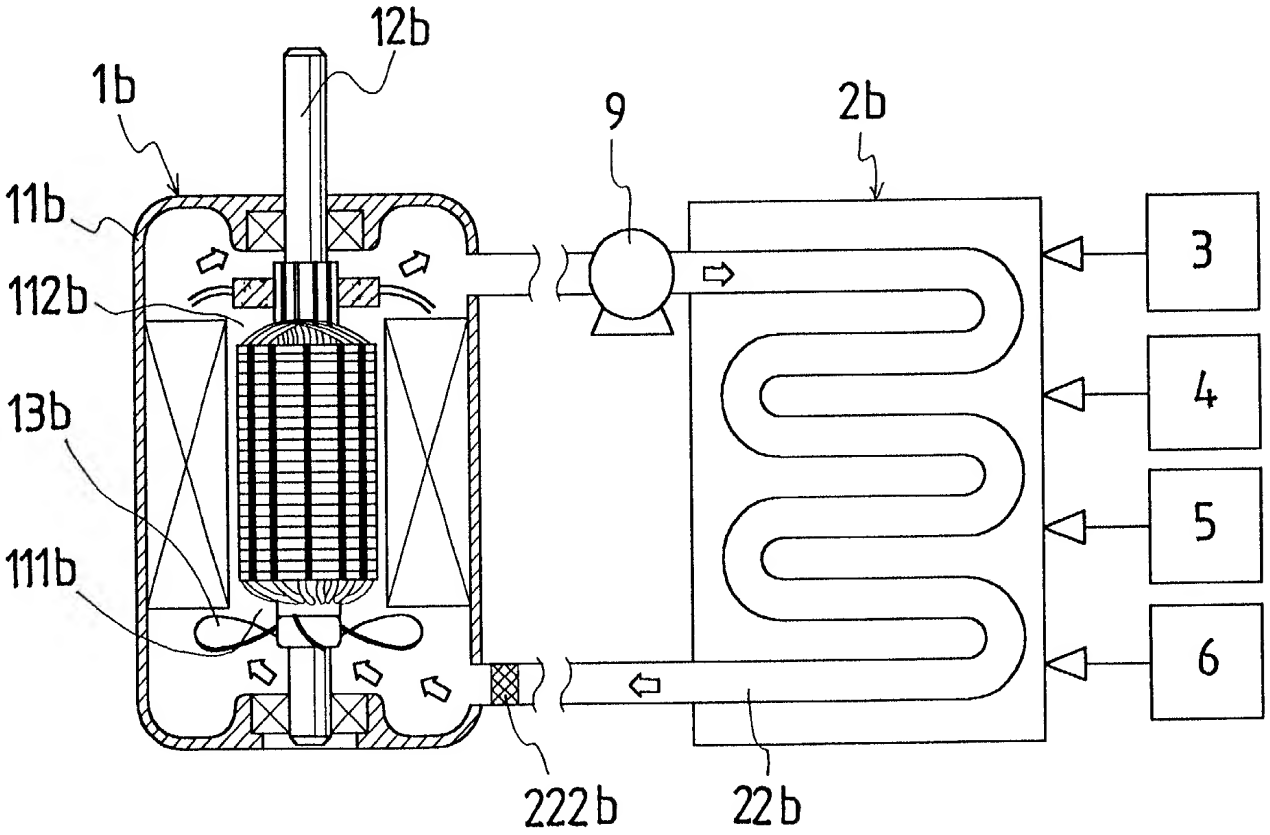


FIG. 9

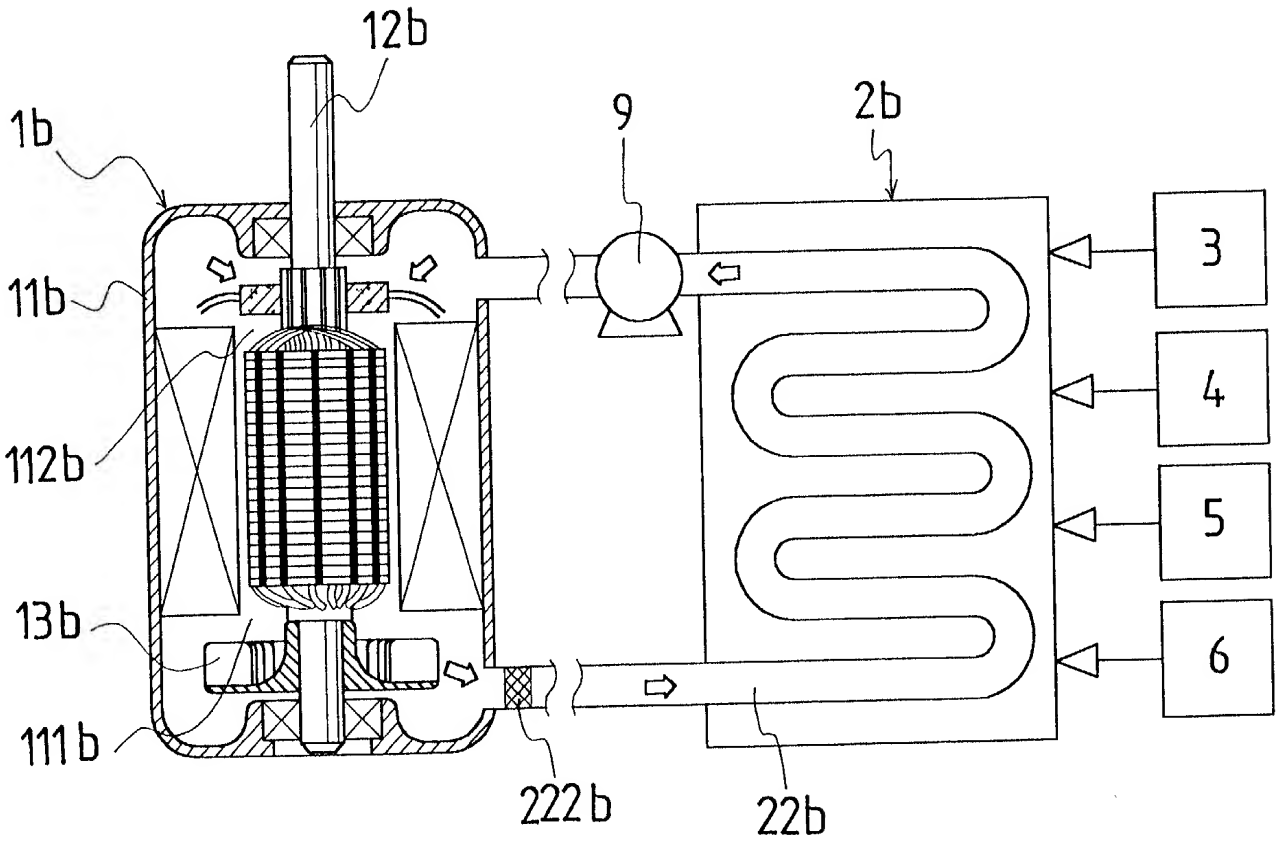


FIG. 10

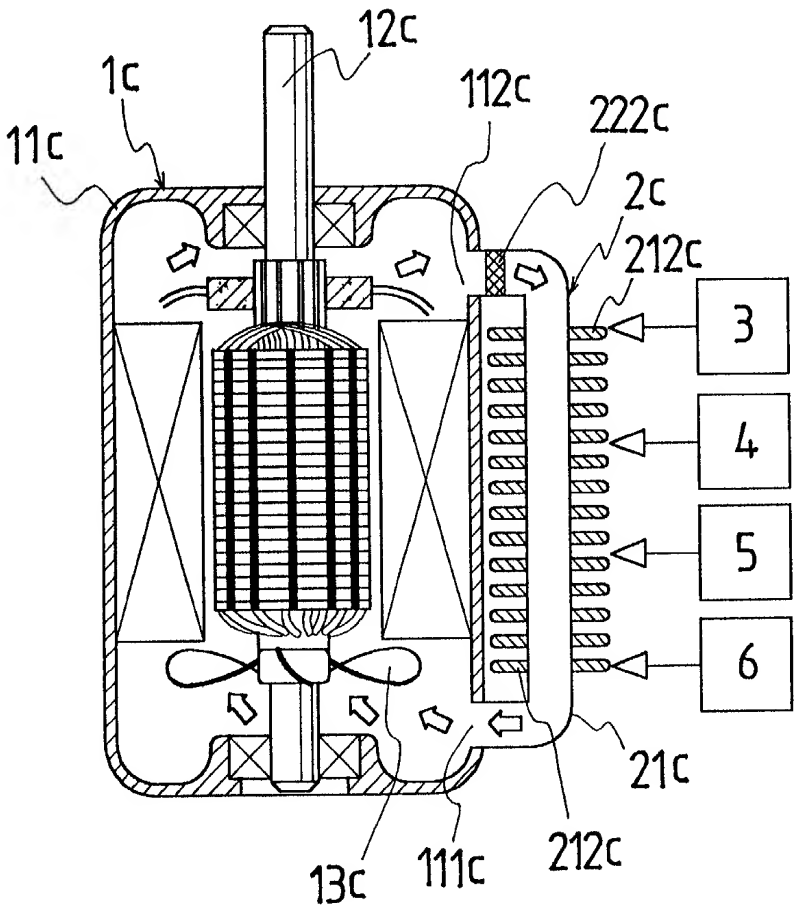


FIG. 11

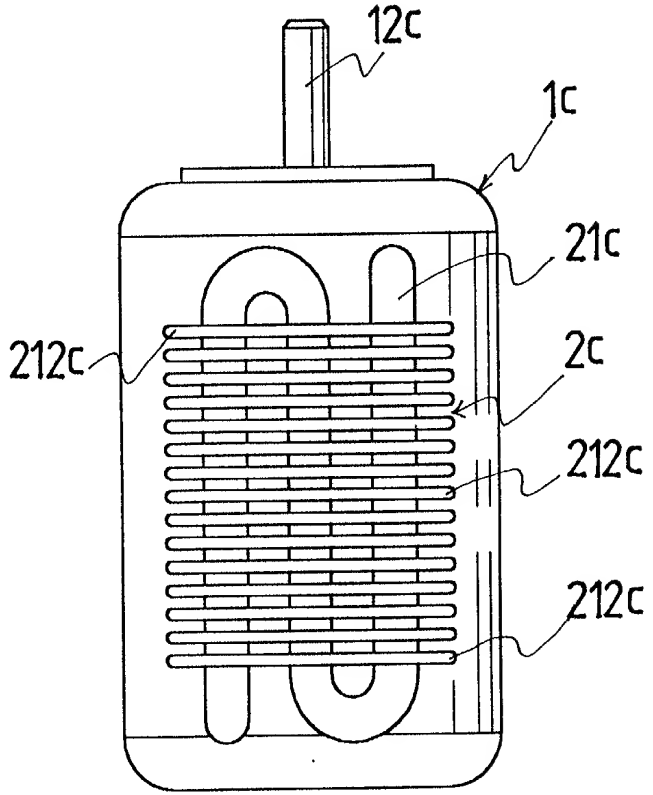


FIG. 12

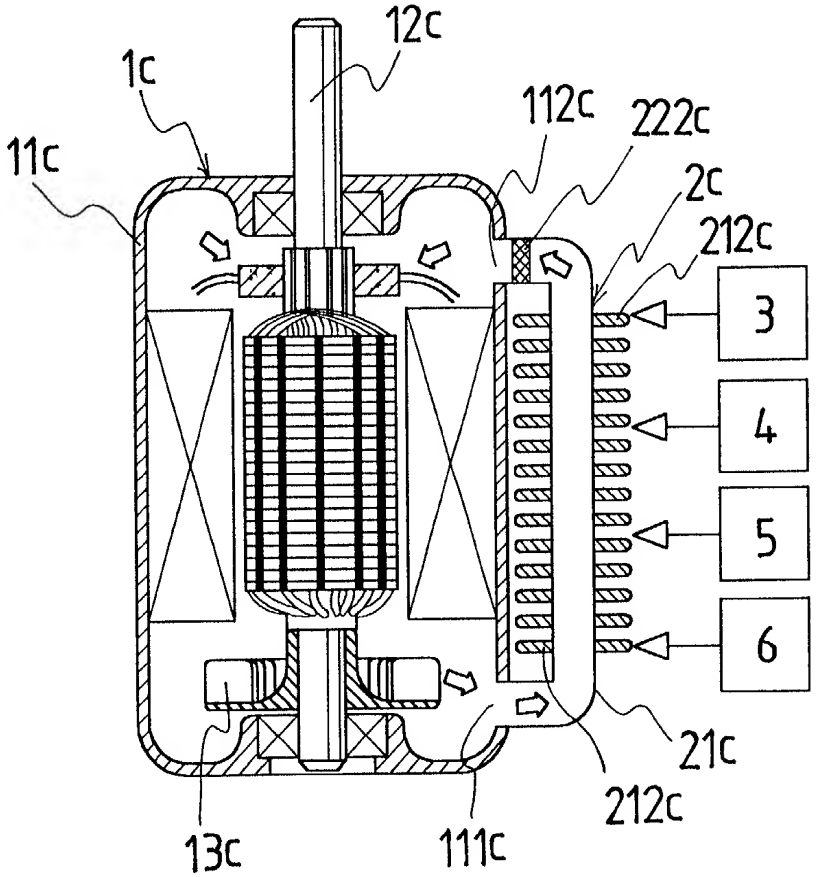


FIG. 13

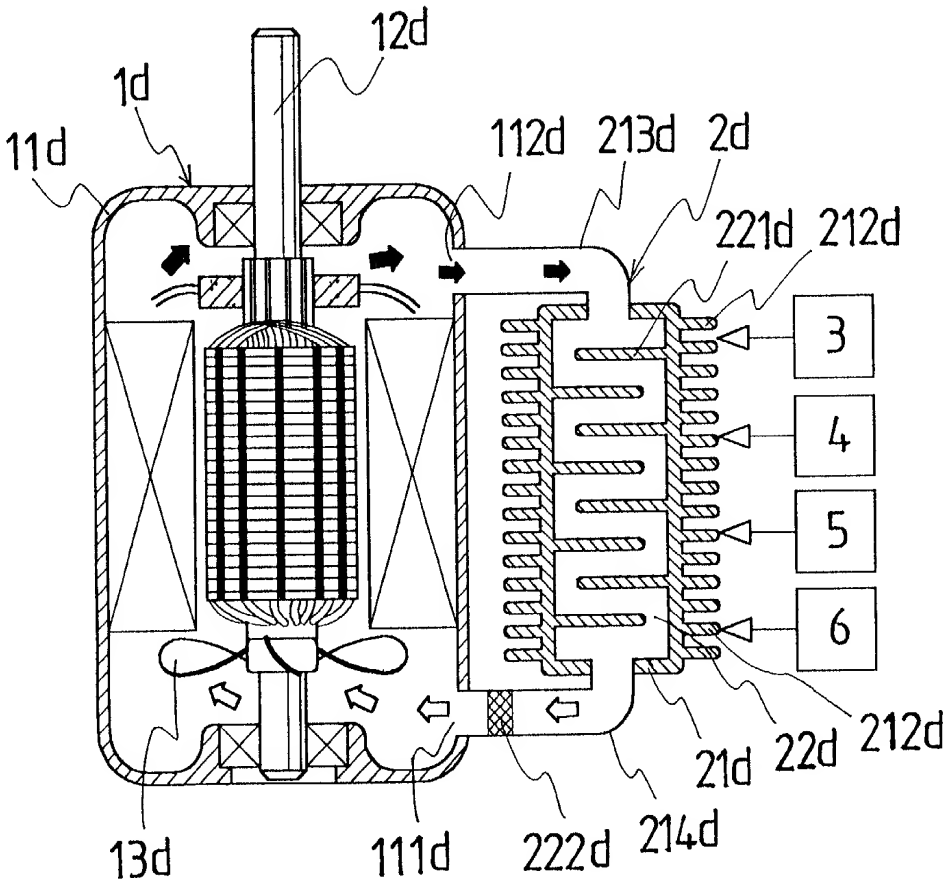


FIG. 14

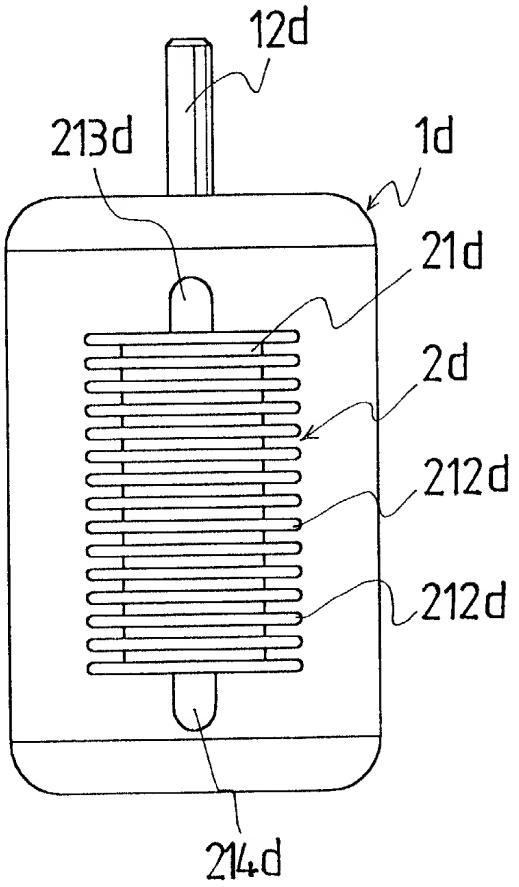


FIG. 15

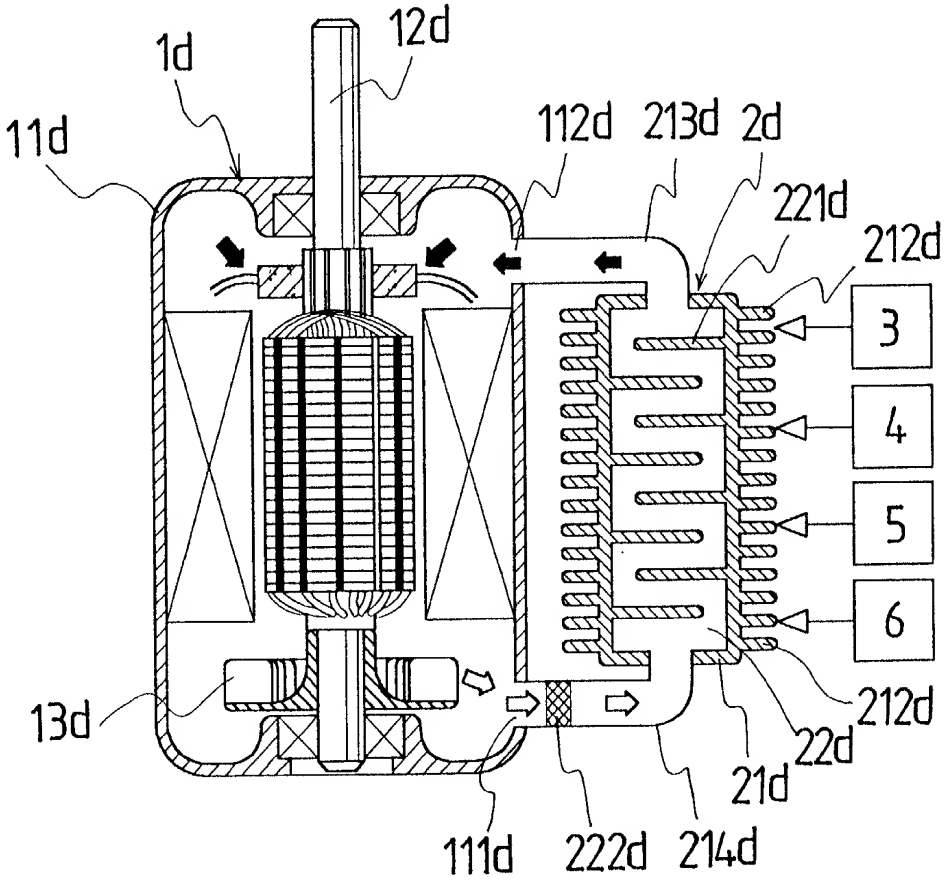
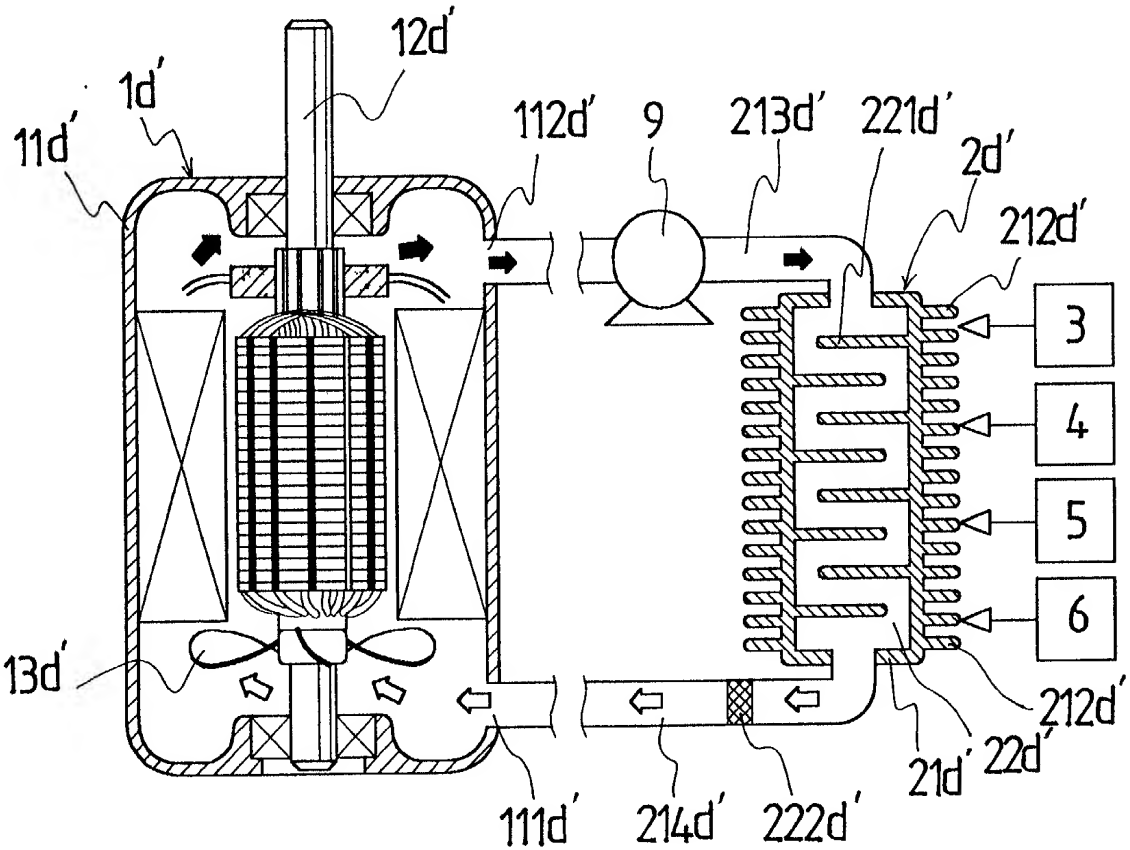


FIG. 16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214d'
222d'

FIG. 17

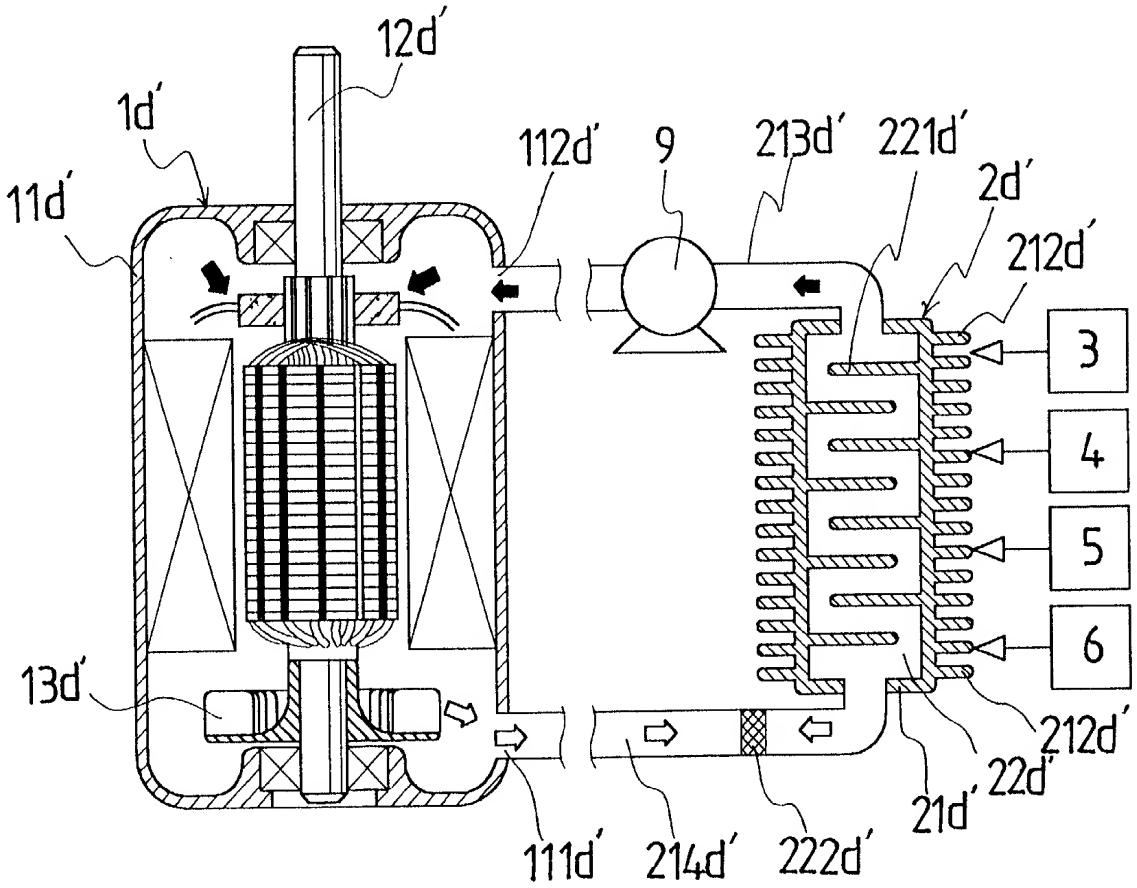

FIG. 18

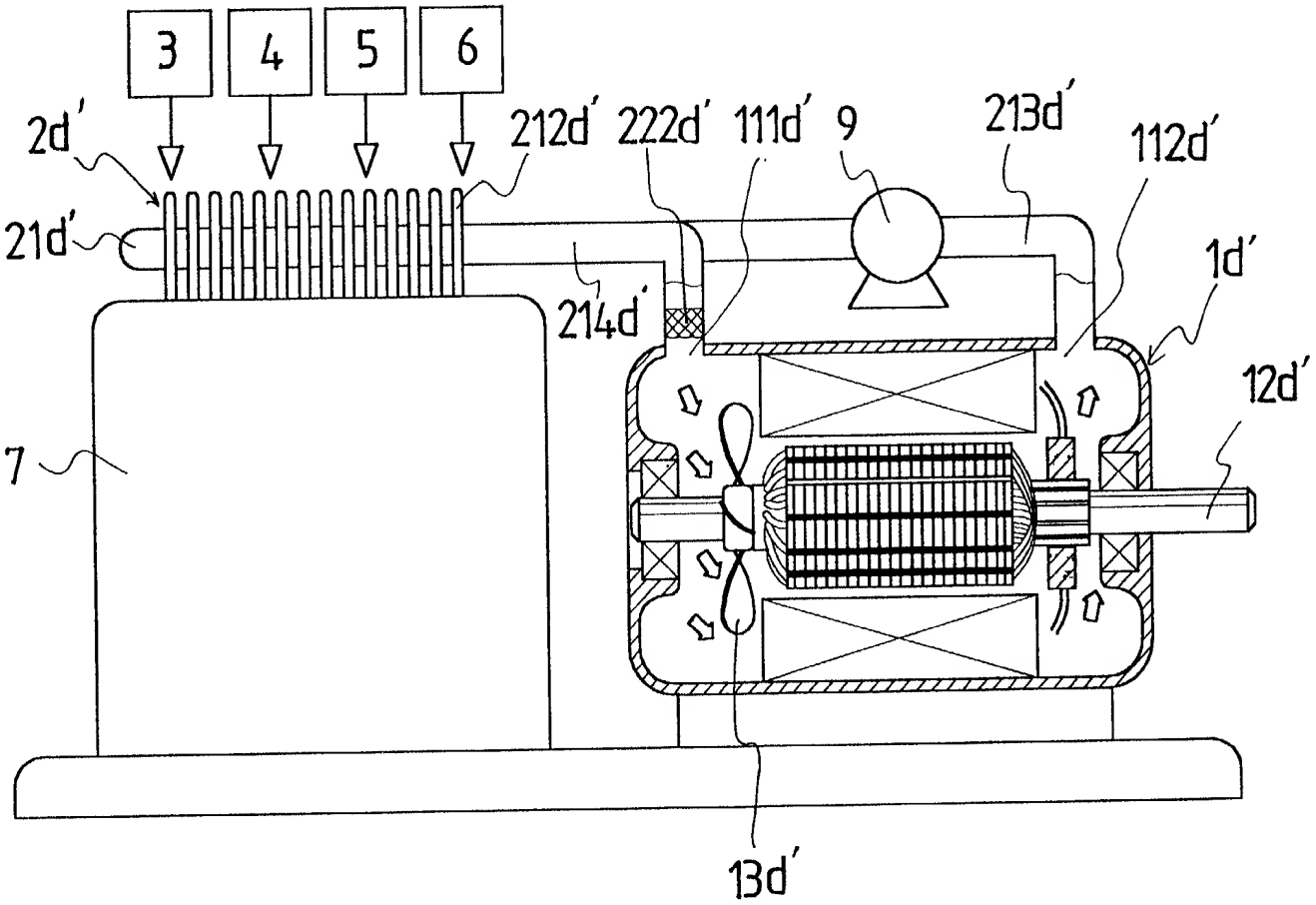

FIG. 19

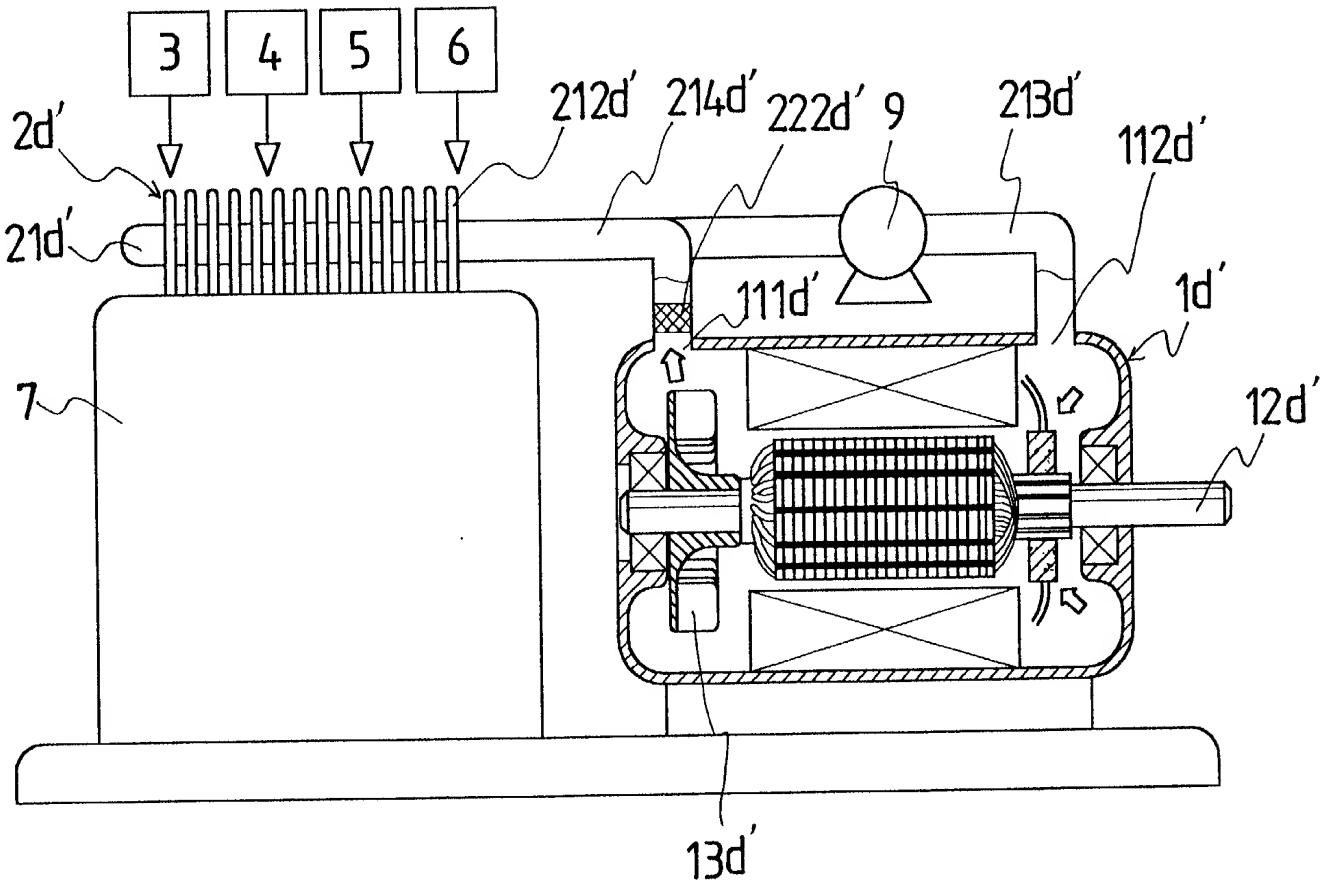

FIG. 20

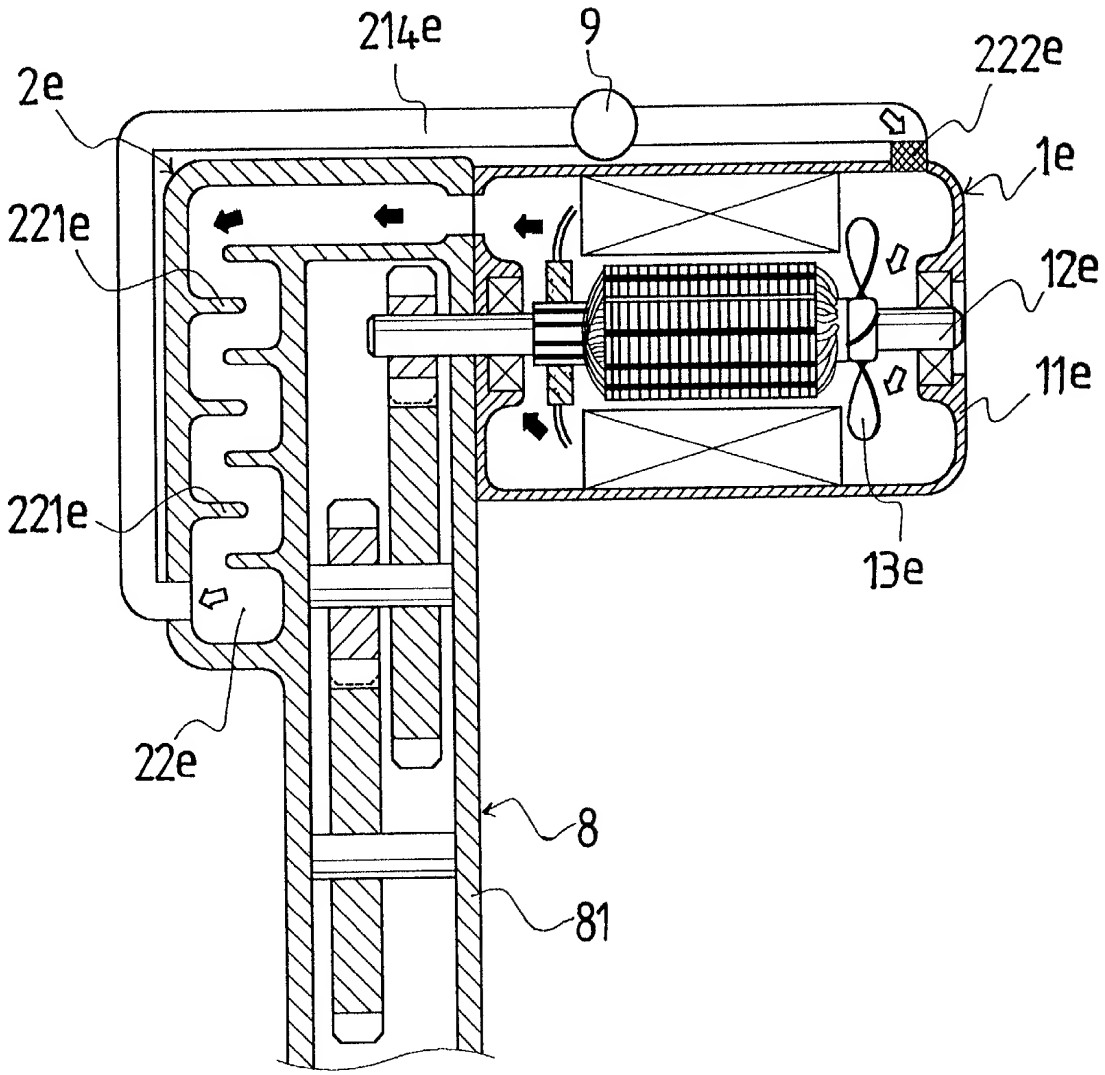

FIG. 21

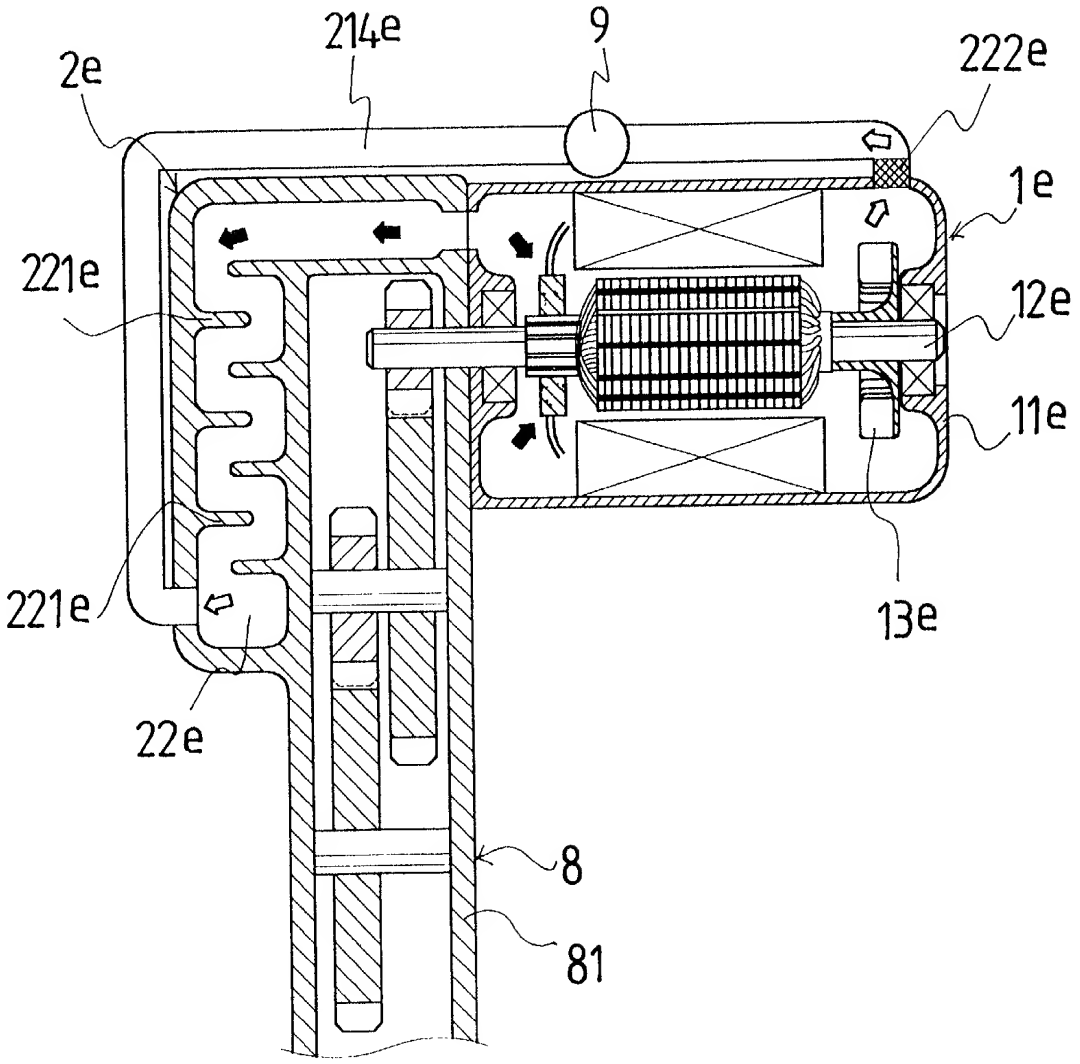

FIG. 22

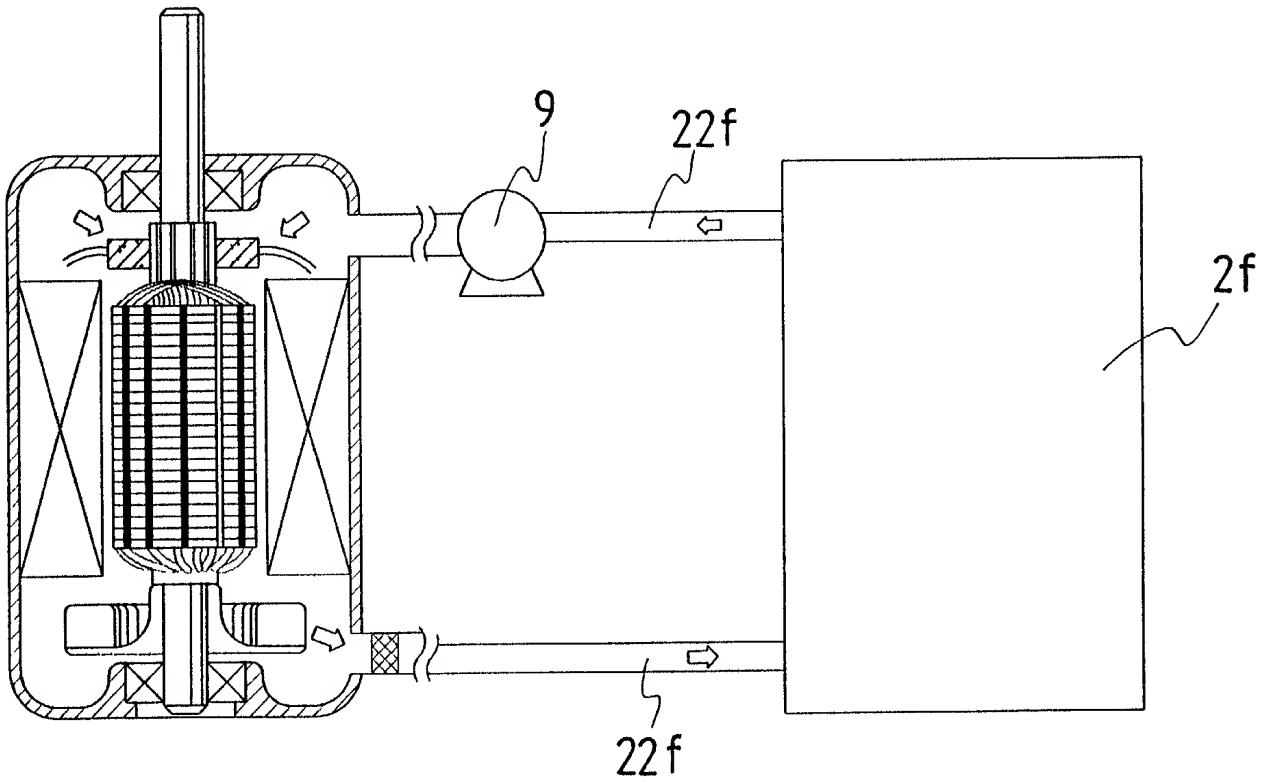

FIG. 23

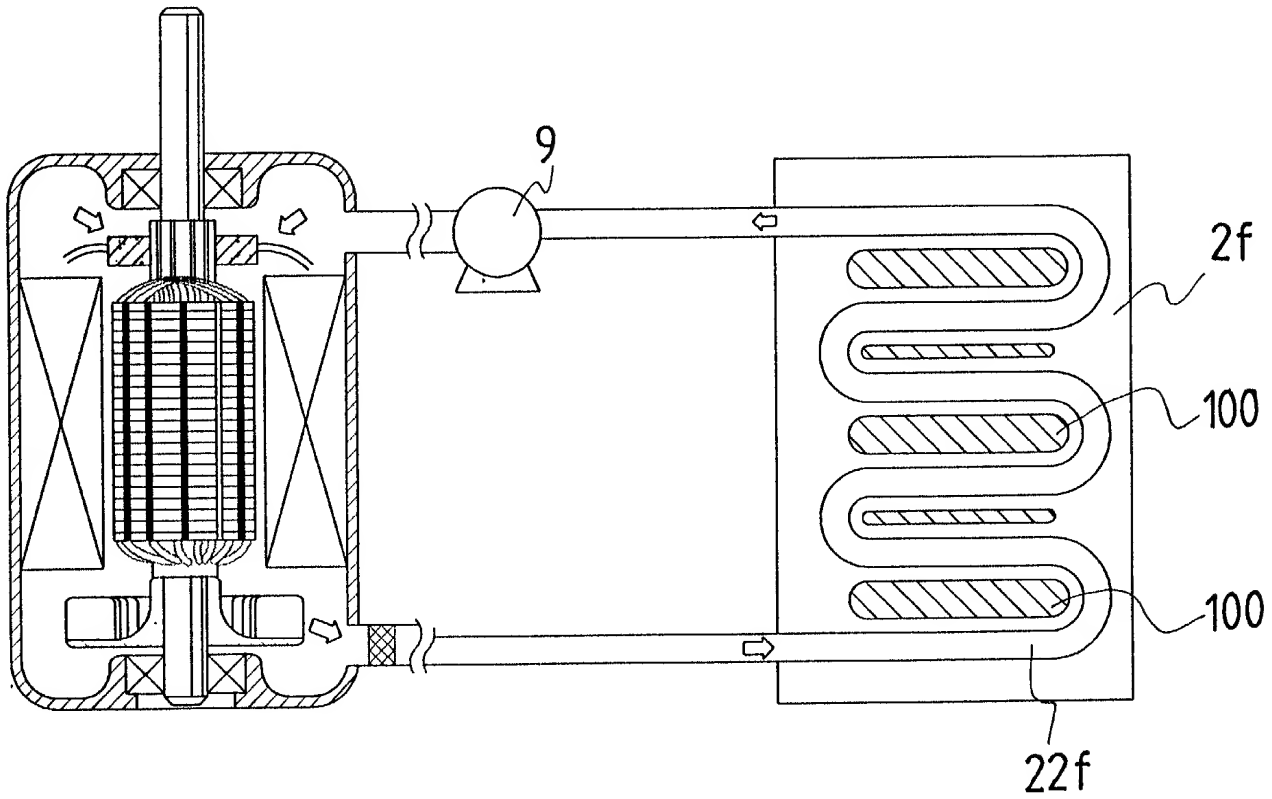

FIG. 24

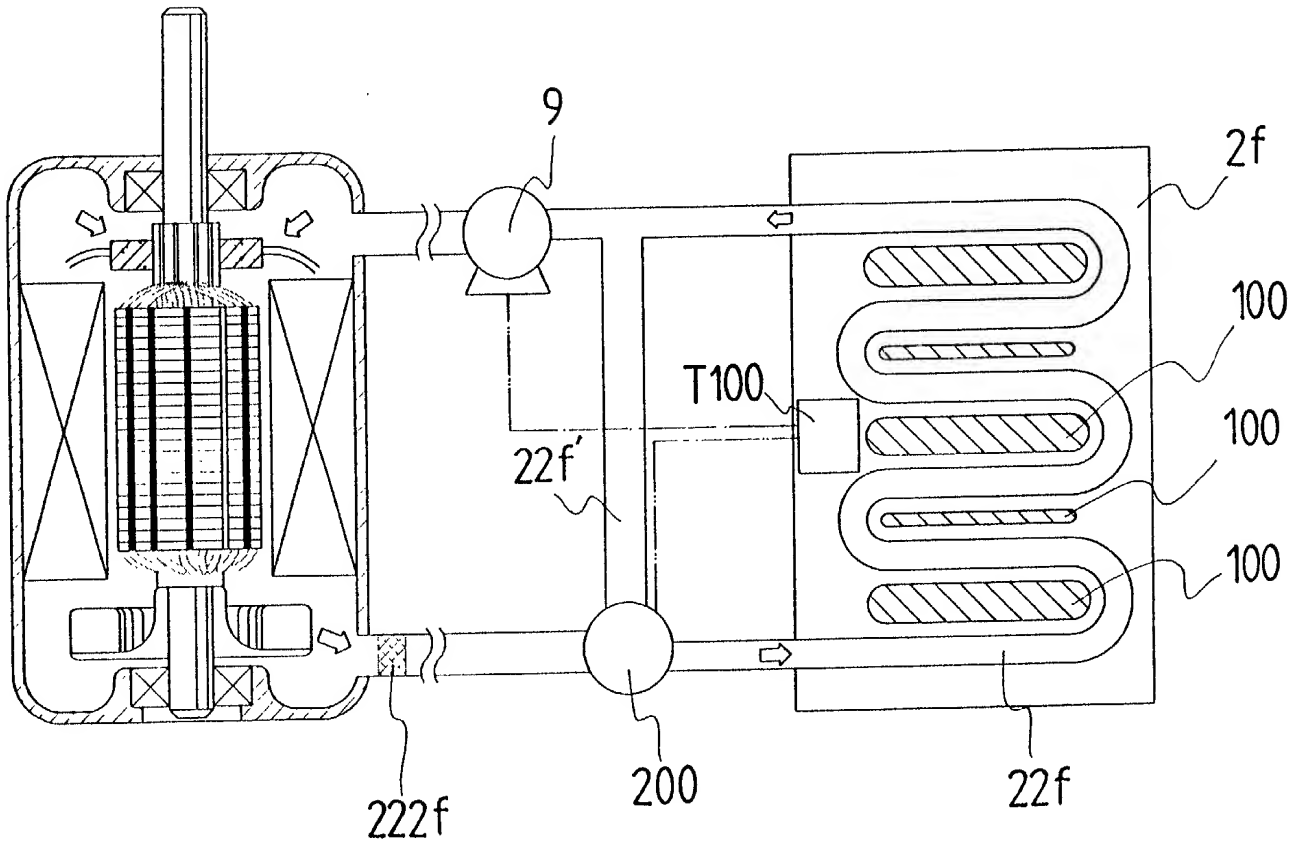

FIG. 25

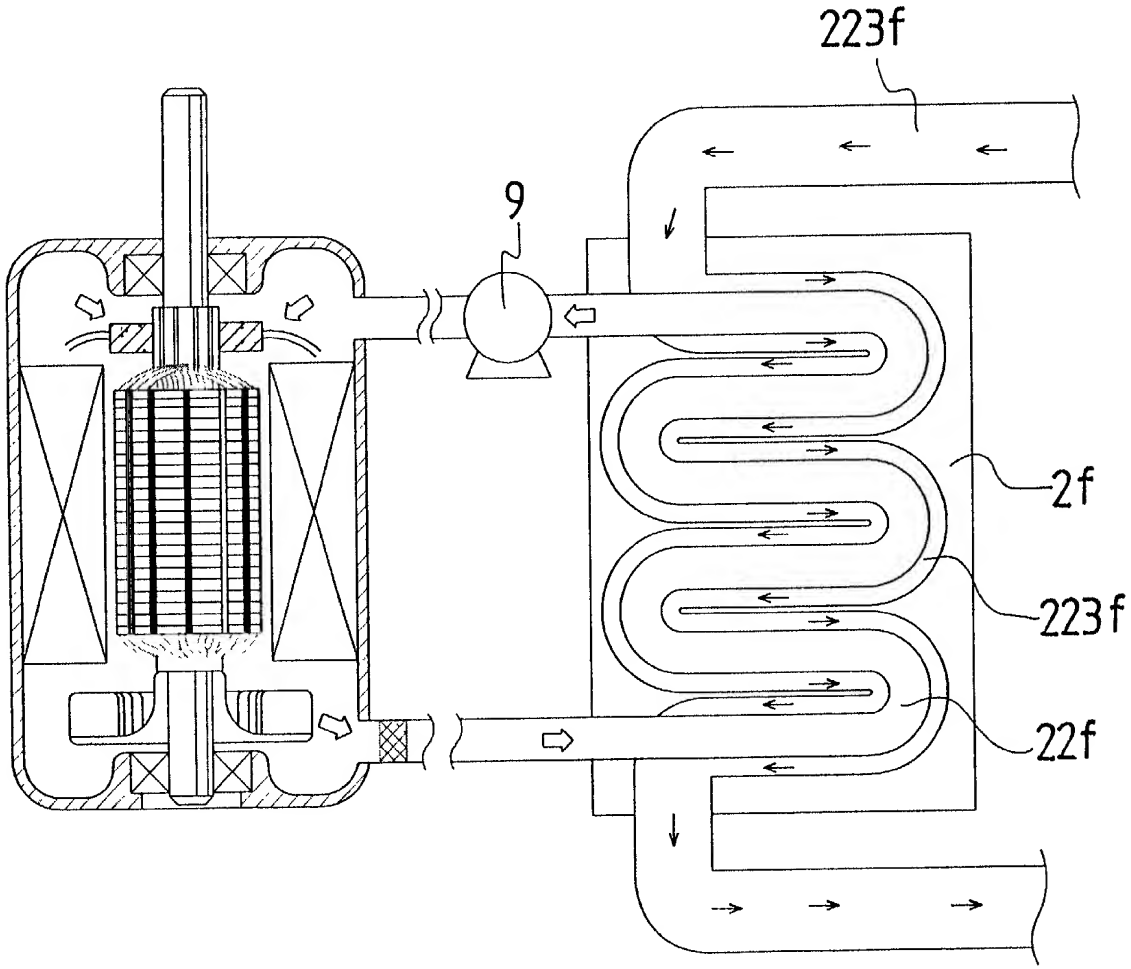

FIG. 26

ATTORNEY/DOCKET NO:

DECLARATION FOR PATENT APPLICATION AND APPOINTMENT OF ATTORNEY

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name: I believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention (Design, if applicable) entitled:

The Enclosed Type Air Cooler Device of the Rotational Electrical Machine

the specification of which (check one):

☒ is attached hereto, or ☐ was filed on: as U.S. Application Number or PCT International Application Number:

and (if applicable) was amended on:

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment(s) referred to above. I acknowledge the duty to disclose information which is material to patentability as defined in *Title 37, Code of Federal Regulations, §1.56*. I hereby claim foreign priority benefits under *Title 35, United States Code §119* of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

PRIOR FOREIGN APPLICATION(S)			PRIORITY CLAIMED	
Number	Country	Day/Month/Year Filed	Yes	No
89109365	Taiwan, R.O.C.	16/05/2000		X

☐ Additional Priority Application(s) Listed on Following Page(s)

I HEREBY CLAIM THE BENEFIT UNDER TITLE 35 U.S. CODE §119(E) OF ANY U.S. PROVISIONAL APPLICATIONS LISTED BELOW.	
Application Number	Day/Month/Year Filed

☐ Additional Provisional Application(s) Listed on Following Page(s)

I hereby claim the benefit under *Title 35, United States Code, §120* of any United States application(s) or PCT international application(s) designating The United States of America listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of *Title 35, United States Code, §112*, I acknowledge the duty to disclose information which is material to patentability as defined in *Title 37, Code of Federal Regulations, §1.56* which became available between the filing date of the prior application(s) and the national or PCT international filing date of this application:

Application Number	Filing Date	Status - Patented, Pending or Abandoned

☐ Additional US/PCT Priority Application(s) listed on Following Page(s)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under *section 1001 of title 18 of the United States Code* and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: I (We) hereby appoint as my (our) attorneys, with full powers of substitution and revocation, to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: J. Ernest Kenney, Reg. No. 19,179; Eugene Mar, Reg. No. 25,893; Richard E. Fichter, Reg. No. 26,382; Charles R. Wolfe, Jr., Reg. No. 28,680; Thomas J. Moore, Reg. No. 28,974; Joseph DeBenedictis, Reg. No. 28,502; Benjamin E. Urcia, Reg. No. 33,805; Chung C. Chen, Reg. No. 31,725; and

I(we) authorize my(our) attorneys to accept and follow instructions from _____ regarding any matter related to the preparation, examination, grant and maintenance of this application, any continuation, continuation-in-part or divisional based thereon, and any patent resulting therefrom, until I(we) or my(our) assigns withdraw this authorization in writing.

Send correspondence to: **BACON & THOMAS, PLLC**
625 Slaters Lane - 4th Floor
Alexandria, VA 22314-1176

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(703) 683-0500

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DATE July 24, 2000	SIGNATURE

_ See following page(s) for additional joint inventors.